# ARITHMETIC.

Conducted by B. F. FINKEL, Springfield, Mo. All contributions to this department should be sent to him.

## SOLUTIONS OF PROBLEMS.

57. Proposed by L. B. FRAKER, Weston, Ohio.

Suppose that in a meadow the grass is of uniform quality and growth and that 6 oxen or 10 colts could eat up 3 acres of the pasture in $\frac{18}{26}$ of the time in which 10 oxen and 6 colts could eat up 8 acres; or that 600 sheep would require $2\frac{6}{7}$ weeks longer than 660 sheep to eat up 9 acres.

In what time would an ox, a colt and a sheep together eat up an acre of the pasture on the supposition that 589 sheep eat as much in a week as 6 oxen and 11 colts? By Arithmetic, if possible.—Hunter's Arithmetic. (Unsolved in *School Visitor.*)

II. Solution by Henry Heaton, M. S., Atlantic, Iowa.

Since 6 oxen$=$10 colts, 1 ox$=1\frac{2}{3}$ colts, and 6 oxen and 11 colts$=$21 colts $=$589 sheep. $\therefore$ 1 colt$=28\frac{1}{21}$ sheep and 1 ox$=1\frac{2}{3}\times28\frac{1}{21}$ sheep$=46\frac{47}{63}$ sheep.

10 oxen and 6 colts$=22\frac{2}{3}$ colts, eat 8 acres of grass in the same time that $\frac{1}{8}$ of $22\frac{2}{3}$ colts or $2\frac{5}{6}$ colts eat 1 acre, and $3\frac{1}{3}$ colts eat an acre in the same time that 10 colts eat 3 acres. Hence $3\frac{1}{3}$ colts eat an acre in $\frac{18}{25}$ the time that $2\frac{5}{6}$ colts eat it. In $\frac{18}{25}$ the time $3\frac{1}{3}$ colts eat as much grass as $\frac{18}{25}$ of $3\frac{1}{3}$ colts or $2\frac{2}{5}$ colts would eat it in the full time. The difference between $2\frac{2}{5}$ colts and $3\frac{1}{3}$ colts is $\frac{13}{30}$ of a colt. The difference in the grass eaten by them is $\frac{7}{25}$ of the growth. Hence $\frac{13}{30}$ of a colt eats $\frac{7}{25}$ of the growth. Hence to eat all the growth will require $\frac{25}{7}$ of $\frac{13}{30}$ of a colt or $\frac{65}{42}$ of a colt$=\frac{65}{42}$ of $28\frac{1}{21}$ sheep$=43\frac{359}{882}$ sheep. To eat the growth on 9 acres will require 9 times $43\frac{359}{882}$ sheep$=390\frac{65}{98}$ sheep. $600-390\frac{65}{98}=209\frac{33}{98}$. $660-390\frac{65}{98}=269\frac{33}{98}$. Hence it will require $209\frac{33}{98}$ sheep $2\frac{6}{7}$ weeks longer to eat the original grass on 9 acres than it will $269\frac{33}{98}$ sheep to eat the same. Hence $209\frac{33}{98}$ sheep eat in the $2\frac{6}{7}$ weeks what the 60 other sheep eat in the first part of the time. Hence this time is $209\frac{33}{98}\times2\frac{6}{7}$ weeks$\div60=9\frac{1993}{2058}$ weeks. Hence it will take $269\frac{33}{98}$ sheep $9\frac{1993}{2058}$ weeks to eat the original grass on 9 acres. To eat 1 acre will require them $1\frac{1993}{18522}$ weeks.

An ox, a colt, and a sheep$=75\frac{50}{63}$ sheep.

If $75\frac{50}{63}$ sheep were eating on one acre, $43\frac{359}{882}$ sheep would eat the growth leaving $32\frac{341}{882}$ sheep to eat the original grass. If it require $269\frac{33}{98}$ sheep $1\frac{1993}{18522}$ weeks to do this, it will require $32\frac{341}{882}$ sheep $(269\frac{33}{98}\div32\frac{341}{882})\times1\frac{1993}{18522}$ weeks$=$ $9\frac{3500813}{17664596}$ weeks.

58. Proposed by B. F. FINKEL, A. M., Professor of Mathematics and Physics, Drury College, Springfield, Missouri.

Two men, A and B, in Boston, hire a carriage for $25, to go to Concord, N. H., and back, the distance being 72 miles, with the privilege of taking in three more persons. Having gone 20 miles, they take in C; at Concord, they take in D; and when within 30 miles of Boston, they take in E. How much shall each man pay? [From *Greenleaf's National Arithmetic.*]

**I. Solution by H. C. WHITAKER, A. M., M. E., Professor of Mathematics, Manual Training School, Philadelphia, Pennsylvania.**

If we denote taking one person one mile by a person-mile, then the total person-miles was 514 and the cost of each of them was 4.8638 cents ; the cost of taking A and B 144 miles was \$7 each ; the cost of taking C 124 miles was \$6.03 ; the cost of taking D 72 miles was \$3.50, and the cost of taking E 30 miles was \$1.46.

**II. Solution by F. M. McGAW, Bordentown, New Jersey ; G. B. M. ZERR, A. M., Ph. D., Professor of Mathematics and Applied Science, Texarkana College, Texarkana, Arkansas-Texas, and H. C. WILKES, Skull Run, West Virginia.**

Five men ride 30 miles ; four, 42 miles ; three, 52 miles ; and two, 20 miles.

$\therefore$ E pays for $\frac{1}{5}$ of $30=6$ miles.

D pays for $\frac{1}{5}$ of $30+\frac{1}{4}$ of $42=16\frac{1}{2}$ miles.

C pays for $\frac{1}{5}$ of $30+\frac{1}{4}$ of $42+\frac{1}{3}$ of $52=33\frac{5}{6}$ miles.

B pays for $\frac{1}{5}$ of $30+\frac{1}{4}$ of $42+\frac{1}{3}$ of $52+\frac{1}{2}$ of $20=43\frac{5}{6}$ miles.

A pays for $\frac{1}{5}$ of $30+\frac{1}{4}$ of $42+\frac{1}{3}$ of $52+\frac{1}{2}$ of $20=43\frac{5}{6}$ miles.

$144:43\frac{5}{6}=\$25:\$7.609\frac{103}{108}$, share of each A and B.

$144:33\frac{5}{6}=\$25:\$5.873\frac{91}{108}$, share of C.

$144:16\frac{1}{2}=\$25:\$2.864\frac{7}{12}$, share of D.

$144:6=\$25:\$1.041\frac{2}{3}$, share of E.

**III. Solution by A. P. REED, A. M., Clarence, Missouri, and J. C. CORBIN, Pine Bluff, Arkansas.**

144 miles = distance A rides, 144 miles = distance B rides, 124 miles = distance C rides, 72 miles = distance D rides, and 30 miles = distance E rides.

They should each pay in proportion to the distance each rides. Hence

$\frac{144}{514}$ of $\$25=\$7.00\frac{100}{257}$ = amount A should pay.

$\frac{144}{514}$ of $\$25=\$7.00\frac{100}{257}$ = amount B should pay.

$\frac{124}{514}$ of $\$25=\$6.03\frac{29}{257}$ = amount C should pay.

$\frac{72}{514}$ of $\$25=\$3.50\frac{50}{257}$ = amount D should pay.

$\frac{30}{514}$ of $\$25=\$1.45\frac{235}{257}$ = amount E should pay.

[NOTE. Greenleaf gives the answers as obtained in the second solution. But we think it is best to solve the problem on the principle that each pay in proportion to the distance he rides. This principle prevails in practice at the present time and is just in its application. EDITOR.]

## PROBLEMS.

**60. Proposed by J. K. ELLWOOD, A. M., Principal of Colfax School, Pittsburg, Pennsylvania.**

A pipe 1 foot long and $\frac{27}{34}$ inch in diameter has a half-inch orifice and weighs $1\frac{3}{4}$ pounds. What is the diameter of a pipe of the same length and orifice, but weighing 41 ounces ?

**61. Proposed by F. P. MATZ, M. Sc., Ph. D., Professor of Mathematics and Astronomy in Irving College, Mechanicsburg, Pennsylvania.**

Insured my store for $a/b$th$=\frac{3}{4}$th part of its value, at $r=1\frac{1}{4}$ per cent.; but soon afterward the store was burned down, and my loss over the insurance was $\$L=\$4150$. What was the value of my store ?